UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/541,970	07/11/2005	Alix Helene Gicquel	05-583	8766

20306 7590 01/29/2008

MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP
300 S. WACKER DRIVE
32ND FLOOR
CHICAGO, IL 60606

EXAMINER	
STOUFFER, KELLY M	

ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
01/29/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/541,970	GICQUEL ET AL.	
	Examiner	Art Unit	
	Kelly Stouffer	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/12/2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/ are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 12 December 2007 with regard to the 35 USC 102(b) and 103(a) rejections using Chow have been fully considered but are moot in view of the new grounds of rejection. Applicant's arguments regarding the 35 USC 103(a) rejection of the claims under Miyanaga et al. are not persuasive. The applicant argues that Miyanaga cannot be used in the rejection because it teaches the use of magnetic fields with plasma. However, the claims do not exclude this feature. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Therefore, this rejection is maintained. However, because the new rejections are due to finding prior art in an updated search, this office action is non-final.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2, 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 2, 7, and 8 recite the limitation "the pulsed discharge". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyanaga et al. (US 5626922).

As to claim 1, Miyanaga et al. discloses plasma CVD method using pulsed microwave plasma to deposit a diamond film (abstract and examples). There is a peak power in order to deposit the film in column 3 et seq., and this inherently contains carbon radicals as a film containing carbon is deposited by plasma due to the operation of plasma CVD. Miyanaga et al. does not explicitly disclose optimal substrate temperatures and plasma densities. However, Miyanaga et al. teaches that the high density plasma depends upon the pressure in the chamber and is optimized for coating efficiency (column 2-3 lines 44-15) and that the concentration of product gas per unit volume, in which the product gas would be recognized to be plasma, may be modified to affect film growth (column 5 lines 55-60). Additionally, Miyanaga et al. teaches that the heating of the substrate, and hence the temperature, depends upon the achievement of a uniform and homogeneous film in view of the applicability of the process to industrial mass production (column 6 lines 53-58). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Miyanaga et al. by routine experimentation to include the claimed plasma densities to ensure efficient film growth and an acceptable growth rate and to include the claimed temperatures in order to achieve a uniform and homogenous film, absent evidence showing criticality for the claimed values.

As to claims 2-4 and 6, the hydrogen concentration in Miyanaga et al. depends upon and is adjusted according to the desired pressure in the chamber and the shape of

the object being coated (as irregular shapes require higher pressure) in column 5 lines 25-60. Therefore, it would have been obvious at the time of the invention to modify Miyanaga et al. by routine experimentation to include the amounts of hydrogen as claimed (and consequently the relative amounts of hydrogen to carbon in the plasma, and vice versa – one of ordinary skill in the art would realize also that these quantities are estimated) in order to adjust the pressure of the chamber and account for all shapes of coated substrates.

As to claim 5, the pulse periods are described in the examples in the claimed ranges and shown in Figures 3A-3C, 4 and 6A-6C.

As to claims 7 and 8, plasma pressures and peak powers are given within the claimed ranges in the examples. Furthermore, plasma pressure and plasma peak power may be modified to adjust film formation rate as discussed above and in column 2-3 lines 44-15 and both are hence result effective variables.

Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vikharev et al. (Diamond and Related Materials 12 (2003) 272-276).

As to claim 1, Vikharev et al. discloses plasma CVD method using pulsed microwave plasma to deposit a diamond film (abstract). There are gases containing hydrogen and carbon (page 272 column 2) and a peak power in order to deposit the film on page 273, along with the description in the entire document, and this inherently contains carbon radicals as a film containing carbon is deposited by plasma due to the operation of plasma CVD. The substrate temperature is within the claimed ranges on

page 273 column 1. Vikharev et al. does not explicitly disclose a peak power density. However, Vikharev et al. teaches that the power density directly affects by film growth rate and film quality (see entire document), as any one of ordinary skill in the art would also perceive. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Vikharev et al. by routine experimentation to include the claimed plasma densities to ensure efficient film growth and a suitable film quality, absent evidence showing criticality for the claimed values. It has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

As to claims 2-4 and 6, the hydrogen concentration in Vikharev et al. depends upon and is adjusted according to the desired pressure in the chamber, film quality, and the shape of the object being coated (as irregular shapes require higher pressure) on pages 273, 275 and 276. Therefore, it would have been obvious at the time of the invention to modify Vikharev et al. by routine experimentation to include the amounts of hydrogen as claimed (and consequently the relative amounts of hydrogen to carbon in the plasma, and vice versa – one of ordinary skill in the art would realize also that these quantities are estimated) in order to adjust the pressure of the chamber, quality of the film, and account for all shapes of coated substrates.

As to claim 5, the pulse periods are in the claimed ranges on page 273 column 2.

As to claims 7 and 8, plasma pressures and peak powers are given within the claimed ranges in the document. Furthermore, plasma peak power, and similarly,

plasma pressure may be modified to adjust film formation rate as discussed above and both are hence result effective variables.

Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow (US 5240749) in view of Vikharev et al.

Chow discloses a method for synthesizing diamond films that includes microwave plasma described in column 2 lines 56-68 in a vacuum chamber 10 in figure 2. Plasma 75 in Figures 3-5 of a finite volume as described in column 2 lines 5-57 is formed near a substrate 15 in Figures 2-5. The plasma 75 is formed from hydrogen and methane gases as described in column 2 line 51 Chow utilizes microwave energy to form the discharge (abstract). The peak absorbed power that generates carbon radicals is broadly included in the disclosure of Chow because the plasma by definition (see Blinov et al. column 3 lines 53-62 cited previously) contains radicals and must have reached a peak power to form said radicals. The plasma 75 containing radicals forms a diamond film 85 in Figures 4 and 5 thereon. The applicant claims that the plasma must have a peak power density of greater than 100 W/cm^3 while maintaining a substrate temperature of between 700-1000 °C. Chow discloses a substrate temperature within the range of 680-750 °C described in column 4 lines 13-14 and power densities of 600 and 1000 W/cm^3 described in column 5 line 50 and line 63, respectively. Chow does not explicitly describe the microwave plasma with an applied pulse. Vikharev teaches applying a pulse to microwave plasma allows using higher pressure of gas mixture without changing the substrate temperature and improves the growth rate of diamond

films. Therefore, it would have been obvious to one of ordinary skill in the art to modify Chow to include a periodic pulsed microwave plasma as taught by Vikharev in order to allow using higher pressure of gas mixture without changing the substrate temperature and improve the growth rate of diamond films.

As to claims 2-4 and 6, the hydrogen concentration in Vikharev et al. depends upon and is adjusted according to the desired pressure in the chamber, film quality, and the shape of the object being coated (as irregular shapes require higher pressure) on pages 273, 275 and 276. Therefore, it would have been obvious at the time of the invention to modify Chow and Vikharev et al. by routine experimentation to include the amounts of hydrogen as claimed (and consequently the relative amounts of hydrogen to carbon in the plasma, and vice versa – one of ordinary skill in the art would realize also that these quantities are estimated) in order to adjust the pressure of the chamber, quality of the film, and account for all shapes of coated substrates. Additionally, Chow discloses the gas used to create the plasma as 1.5 % methane in a hydrogen gas environment in column 4, lines 1-4. This meets the recitation in claim 3 that the gas containing hydrogen and carbon must have a molar ratio of between 1-12 % at least as broadly recited in the claim.

As to claim 5, the pulse periods are in the claimed ranges on page 273 column 2 of Vikharev. The ratio of time from the low to high power state is one in claims 3-4 of Chow.

As to claims 7 and 8, plasma pressures and peak powers are given within the claimed ranges in the document. Furthermore, plasma peak power, and similarly,

plasma pressure may be modified to adjust film formation rate as discussed above and both are hence result effective variables. Also, the plasma is contained within the cavity shown in Figure 5 of Chow and the pressure falls within the claimed ranges in column 4 lines 15-20.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1792

kms

TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER